UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sustainable Fisheries Division
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Seattle, Washington 98115-0070

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MEMORANDUM FOR To The Record

FROM William L. Robinson
Assistance Regional Administrator
Northwest Region

SUBJECT Review of Chinook Bycatch During 2000 and 2001 Pacific Coast Whiting Fisheries and National Marine Fisheries Services (NMFS)Endangered Species Act (ESA) Section 7 Consultation of 1999 for the Pacific Coast Groundfish Fishery Management Plan

This memorandum, with attachments, documents NMFS Northwest Region, Sustainable Fisheries Division's review of the above noted section 7 consultation (NMFS 1999) in light of listed chinook bycatches during the 2000 and 2001 Pacific Coast whiting fisheries. That consultation analyzed the impacts of the Pacific whiting fishery on ESA listed chinook and through an incidental take statement allowed for an annual bycatch limit of 11,000 chinook. This is a multi-year consultation that requires annual review of bycatch, as well as other circumstances that may impact listed fish. The fisheries are managed using annual harvest quotas, time and area restrictions, landing limits, species-to-species bycatch limits, and other measures designed to limit impacts on listed fish and to other species of concern.

During the 2000 Pacific whiting fishery, the reported chinook bycatch was 11,527, exceeding the allowable limit. As detailed in the attached report, NMFS reviewed all factors surrounding the fishery, met with the fishery managers to review their practices and determine why the limit was exceeded. In fact NMFS advised the fishery managers that it would be reinitiating the 1999 consultation. However, after further reviewing the fishery, especially the fishing management practices to limit bycatches, NMFS decided to wait for the results of the 2001 fishery in case the 2000 season was an exception. Before reinitiating consultation, NMFS wanted to be able to assess whether there were changes in the fishery or status of the listed fish that would require reevaluation of the fishing management plans, and possibly changes to the conclusions of the 1999 consultation. During the 2001 Pacific whiting fishery, the chinook bycatch was less than 7,000.

Based on its review of how the whiting fisheries were conducted in 2000 and 2001 (including industry bycatch minimization measures), its review of the status of the affected listed chinook, environmental baseline information, and especially the incidental take statement of the 1999 consultation, NMFS has determined that reintiation is not required. The attached "Review of the Whiting Fishery in 2000 and 2001, April 22, 2002" fully documents NMFS review and assessment of the factors supporting this decision. Specifically the NMFS 1999 no jeopardy conclusion would remain the same and no changes are required to the incidental take statement.

Attachments:
Review of Salmon Bycatch in the Pacific Coast Whiting Fishery in 2000 and 2001
Appendix 1

cc: Richard Methot, Elizabeth Clarke (NWFSC); Paula Evans (SF3); Lamont Jackson (PR3); Michael Bancroft (NWGC); Reading File

Review of Salmon Bycatch
in the Pacific Coast Whiting Fishery
in 2000 and 2001

April 22, 2002

Background

The groundfish fisheries in the Exclusive Economic Zone (EEZ) off California, Oregon, and Washington are managed under authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Annual management recommendations are developed in accordance with the Pacific Coast Groundfish Fishery Management Plan (FMP) of the Pacific Fishery Management Council (PFMC). The PFMC provides its management recommendations to the Secretary of Commerce, who implements the measures in the EEZ if they are found to be consistent with the Magnuson-Stevens Act and other applicable law. The Pacific whiting fishery is the largest mid-water trawl groundfish fishery managed by the PFMC.

The whiting fishery occurs along the Pacific coast from northern California to southern British Columbia, Canada. Ocean management areas for groundfish fisheries off the Pacific coast include from north to south: Vancouver, Columbia, Eureka, Monterey, and Conception (Figure 1). The whiting fishery generally occurs from April through November.

Four industry sectors participate in the whiting fishery including, shore-based, catcher processors, motherships, and Tribal mothership operations (Dorn et. al. 1999). The total allowable whiting catch is allocated annually between the four industry sectors. Recent court decisions related to U.S. v. Washington clarified that the treaty rights for Washington coastal tribes includes the right to fish for whiting. Currently, the Makah Tribe is the only one of the Washington coastal tribes that participates in the fishery. The Makah started fishing whiting commercially in 1996.

NMFS has consulted on the PFMC groundfish fisheries on several occasions. The sequence of consultations related to the PFMC groundfish FMP is reviewed in the December 15, 1999 biological opinion (NMFS 1999). Table 1 provides a summary of the dates of past consultations and the ESUs covered.

NMFS reinitiated the 1996 consultation on December 15, 1999 consultation to consider the effects of the groundfish FMP on the 22 new threatened and endangered ESUs of salmonids that had been listed since the previous consultation in May 1996 (Table 2). NMFS also needed to consider the updated information for the Snake River fall (SRF) chinook ESU. Based on this review, NMFS concluded that continued implementation of the PFMC groundfish FMP as amended would not jeopardize the continued existence of any of the salmonid ESUs listed, or proposed for listing, as threatened or endangered under section 7 of the ESA. The 1999 biological opinion reaffirmed the incidental catch limit of 0.050 chinook/mt of whiting and 11,000 chinook per year in the whiting fishery.

Table 1. NMFS biological opinions on PFMC groundfish fisheries implemented under the FMP.

Date	ESUs covered
August 10, 1990	Sacramento River winter-run chinook salmon
November 26, 1991	Sacramento River winter-run chinook salmon and Snake River sockeye salmon
August 28, 1992	Sacramento River winter-run chinook salmon, Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River fall chinook salmon
September 27, 1993	Snake River fall chinook salmon
May 14, 1996	Snake River fall chinook salmon
December 15, 1999	22 new Evolutionarily Significant Units (ESUs) of salmonids & Snake River fall chinook salmon

The whiting fishery is actively monitored and managed to minimize salmon bycatch. The incidental take statement (ITS) of the most recent opinion requires continuous monitoring of the bycatch rate, a monthly evaluation of the projected annual total bycatch rate, as well as catch and fishery management adjustments if needed during the course of the fishery. Conservation constraints for the whiting fishery, and voluntary measures taken by the industry to reduce bycatch, are discussed in the "Measures Taken to Reduce Bycatch" section of this report.

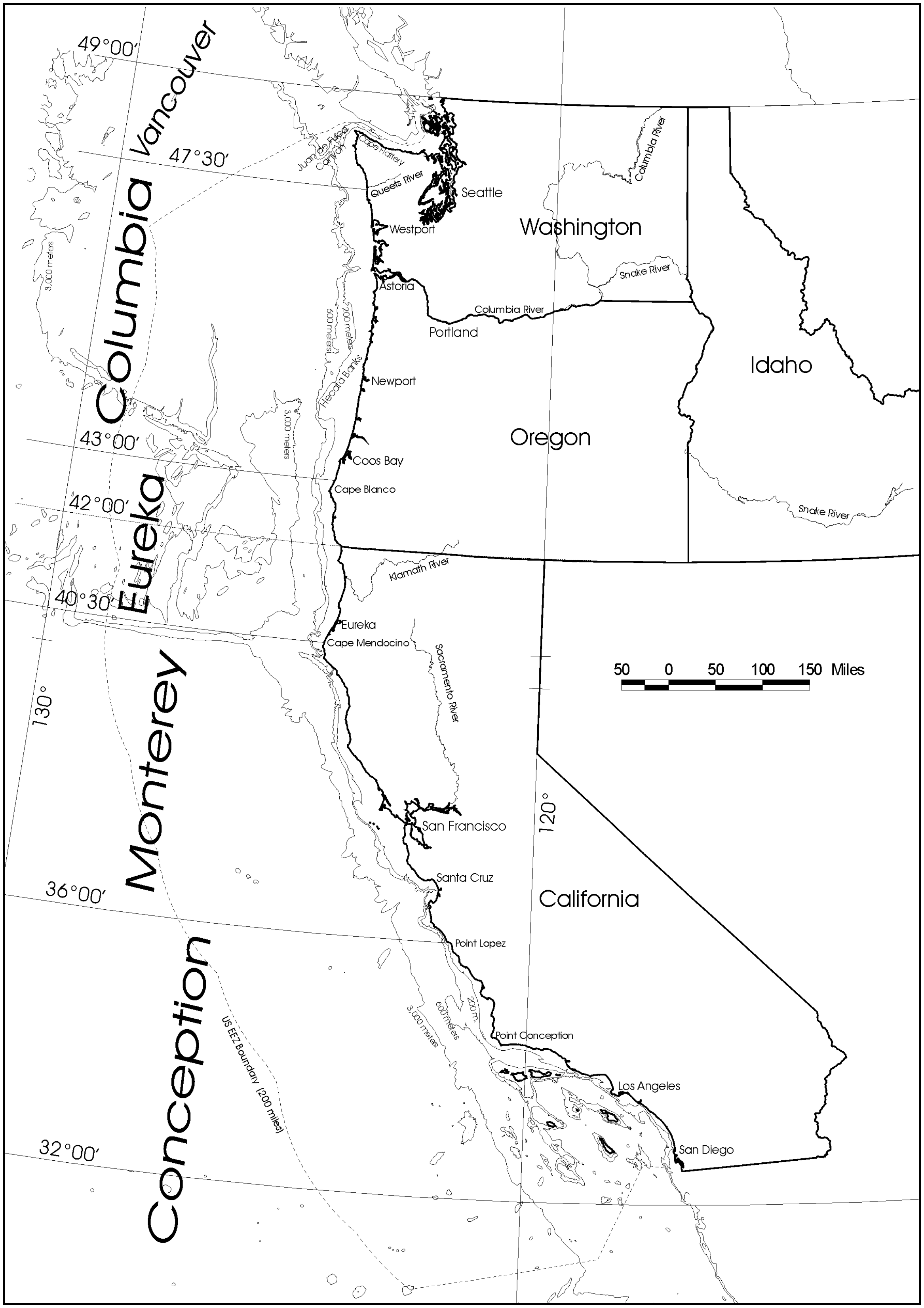

Figure 1. Ocean management areas for groundfish fisheries off the Pacific Coast.

Updated Status of the ESA Listed Species and Critical Habitat

In earlier biological opinions NMFS established that virtually all of the salmonids caught in the groundfish fishery are chinook salmon. NMFS concluded that listed cutthroat trout, steelhead, coho, and chum would be caught rarely, if ever in the groundfish fisheries (NMFS 1999). Of the nine ESA listed chinook ESUs, NMFS (1999) determined that the SRF, Lower Columbia River (LCR), Upper Willamette River (UWR), and Puget Sound (PS) chinook salmon ESUs were the ones most likely to be subject to measurable impacts (Table 2). However, even for these, the exploitation rates were expected to be quite low, generally less than 1% per year. The 1999 biological opinion reviewed the status of these four affected chinook ESUs in some detail, and that review is updated in this section. Generally, the abundance for each of the ESUs has increased in recent years.

In its review of population status and the effects of proposed actions on listed salmonid ESUs, NMFS is relying increasingly on developing science from several areas including the Cumulative Risk Initiative (CRI)(NWFSC 2000, NMFS 2000a), Viable Salmonid Populations (VSP) paper (McElhany et al. 2000), and Rebuilding Exploitation Rate (RER) analysis. These initiatives are described in a more detail in a recent biological opinion on fall season fisheries in the Columbia River (NMFS 2001). Related information is reported here to update the information on species status from the 1999 biological opinion.

Since the 1999 biological opinion, critical habitat was designated for 19 ESUs of salmon and steelhead (February 16, 2000, 65 FR 7764). Marine areas, including those within the action area, are not included as part of the designated critical habitat for any of the ESUs. Only the Northern California Steelhead ESU, listed on June 7, 2000 (65 FR 36074), has yet to have critical habitat designated.

Table 2. Summary of Pacific salmon and steelhead Evolutionarily Significant Units (ESUs) listed under the ESA. The ESUs that are the focus of this report are in bold.

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice	
Chinook Salmon (*O. tshawytscha*)	Sacramento River Winter	Endangered	54 FR 32085	8/1/89
	Snake River Fall	Threatened	57 FR 14653	4/22/92
	Snake River Spring/Summer	Threatened	57 FR 14653	4/22/92
	Puget Sound	Threatened	64 FR 14308	3/24/99
	Lower Columbia River	Threatened	64 FR 14308	3/24/99
	Upper Willamette River	Threatened	64 FR 14308	3/24/99
	Upper Columbia River Spring	Endangered	64 FR 14308	3/24/99
	Central Valley Spring	Threatened	64 FR 50394	9/16/99
	California Coastal	Threatened	64 FR 50394	9/16/99
Chum Salmon (*O. keta*)	Hood Canal Summer-Run	Threatened	64 FR 14508	3/25/99
	Columbia River	Threatened	64 FR 14508	3/25/99
Coho Salmon (*O. kisutch*)	Central California Coastal	Threatened	61 FR 56138	10/31/96
	S. Oregon/N. California Coastal	Threatened	62 FR 24588	5/6/97
	Oregon Coastal	Threatened	63 FR 42587	8/10/98
Sockeye Salmon (*O. nerka*)	Snake River	Endangered	56 FR 58619	11/20/91
	Ozette Lake	Threatened	64 FR 14528	3/25/98
Steelhead (*O. mykiss*)	Southern California	Endangered	62 FR 43937	8/18/97
	South-Central California	Threatened	62 FR 43937	8/18/97
	Central California Coast	Threatened	62 FR 43937	8/18/97
	Upper Columbia River	Endangered	62 FR 43937	8/18/97
	Snake River Basin	Threatened	62 FR 43937	8/18/97
	Lower Columbia River	Threatened	63 FR 13347	3/19/98
	California Central Valley	Threatened	63 FR 13347	3/19/98
	Upper Willamette River	Threatened	64 FR 14517	3/25/99
	Middle Columbia River	Threatened	64 FR 14517	3/25/99
	Northern California	Threatened	65 FR 6960	2/11/00

Snake River Fall Chinook

Counts of adult fish of natural-origin declined through the 1970s and 1980s reaching a low of 78 individuals in 1990 (Table 3). Since then, the return of natural-origin fish to Lower Granite Dam (LGD) has been variable, but generally increasing with 905 and 857 wild chinook returning in 1999 and 2000, respectively (Table 3). In 2001, over 8,700 fall chinook crossed LGD including almost 2,700 natural-origin fish (Table 3)(Sands 2002).

These returns can be compared to the previously identified lower abundance threshold of 300 and the recovery escapement goal of 2,500, which are the kinds of benchmarks suggested in the Viable Salmonid Populations paper (McElhany et al. 1999) for evaluating population status. The lower threshold is considered indicative of increased relative risk to a population in the sense that the further and longer a population is below the threshold the greater the risk; it was clearly not characterized as a "redline" below which a population must not go (BRWG 1994). Recent escapements have been well below this goal, but consistently above the lower abundance threshold. In 2001, the LGD escapement of nearly 2,700 natural-origin fish is the highest in decades (Table 3).

A further consideration regarding the status of SR fall chinook is the existence of the Lyons Ferry Hatchery stock which is considered part of the ESU. The return of adults to LGD from the supplementation program has increased from 479 in 1998 to 1,278 in 2000 (this is in addition to the adults returning from natural production (Table 3). The preliminary estimate in returns from the supplementation program in 2001 is 5,353 fish, well above any previously recorded year (Sands 2002).

The existence of the Lyons Ferry program has been an important consideration in evaluating the status of the ESU since it reduces the short-term risk of extinction by providing a reserve of fish from the ESU. The return of fish from the supplementation program is not a substitute for recovery which depends on the return of self-sustaining populations in the wild. However, supplementation can be used to mitigate the short-term risk of extinction by boosting the initial abundance of spawners while other actions are taken to increase the productivity of the system to the point where the population is self-sustaining and supplementation is no longer required.

For the SR fall chinook salmon ESU, NMFS estimated that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.86, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000a). NMFS has also estimated the risk of absolute extinction for the aggregate SR fall chinook salmon population for periods of 24 and 100 years, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.40 (Table B-5 in McClure et al. 2000a). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 1.00 (Table B-6 in McClure et al. 2000a). The risk of extinction within 24 years is 0 regardless of the effect of hatchery fish.

Table 3. Escapement and Stock Composition of Fall Chinook at Lower Granite Dam[a]						
Year	L. Granite Count	Marked Fish to Lyons Ferry Hatch.	L. Granite Dam Escapement	Stock Comp. of L. Granite Escapement		
					Hatchery Origin	
				Wild	Snake R.	Non-Snake R.
1975	1000		1000	1000		
1976	470		470	470		
1977	600		600	600		
1978	640		640	640		
1979	500		500	500		
1980	450		450	450		
1981	340		340	340		
1982	720		720	720		
1983	540		540	428	112	
1984	640		640	324	310	6
1985	691		691	438	241	12
1986	784		784	449	325	10
1987	951		951	253	644	54
1988	627		627	368	201	58
1989	706		706	295	206	205
1990	385	50	335	78	174	83
1991	630	40	590	318	202	70
1992	855	187	668	549	100	19
1993	1170	218	952	742	43	167
1994	791	185	606	406	20	180
1995	1067	430	637	350	1	286
1996	1308	389	919	639	74	206
1997	1451	444	1007	797	20	190
1998	1909	947	962	306	479	177
1999	3381	1519	1862	905	879	78
2000	3830	1372	2458	857	1278	323
2001[b]	11,590	2,872	8,718	2,652	5,353	713

[a] Information taken from Revised Tables for the Biological Assessment of Impacts of Anticipated 2001 Fall Season Columbia River Mainstem and Tributary Fisheries on Snake River Salmon Species Listed Under the ESA, prepared by the U.S. v. Oregon Technical Advisory Committee.
[b] Preliminary estimates (Sands 2002).

Lower Columbia River Chinook

The LCR ESU includes spring stocks and fall tule[1] and bright[2] components. The remaining spring stocks in the ESU are found in the Sandy River on the Oregon side, and Lewis, Cowlitz, and Kalama Rivers on the Washington side. Table 4 shows the estimated Lower Columbia River spring chinook tributary returns. All four tributaries have increased returns in recent years.

Table 4. Estimated Lower Columbia River spring chinook tributary returns, 1992-2001. (ODFW/WDFW 2002, LeFleur 2001, PFMC 2002a)

Year	Sandy R.	Cowlitz R.	Lewis R.	Kalama R.	Total Returns Excluding the Willamette System
1992	8,600	10,400	5,600	2,400	27,200
1993	6,400	9,500	6,600	3,000	25,500
1994	3,500	3,100	3,000	1,300	10,900
1995	2,500	2,200	3,700	700	9,100
1996	4,100	1,800	1,700	600	8,200
1997	5,200	1,900	2,200	500	9,900
1998	4,200	1,100	1,600	400	7,300
1999	3,300	1,600	1,800	1,000	7,600
2000	3,800	1,700	2,200	1,400	9,100
2001	5,600	1,700	2,200	1,700	11,200

There are four self-sustaining natural populations of tule chinook in the LCR (Coweeman, East Fork Lewis, Clackamas, and Sandy rivers) that are not substantially influenced by hatchery strays. Recent estimates of escapement associated with maximum sustained yield (MSY) and maximum sustained production (MSP) for the Coweeman stock are 350 and 500 spawners, respectively. Recent 5 and 10 year average escapements to the Coweeman are about 800 and 600 fish. The escapements from 1998-2000 were lower averaging only about 120 fish, but were up

[1] "Tules" spawn within a few weeks of river return. They are distinguished by their dark skin coloration and advanced state of maturation at the time of freshwater entry (WDF et al. 1993) and exhibit distinct secondary maturation characteristics (including resorbed scales and pronounced kype). Most tule populations return to production areas lower in the Columbia River drainage

[2] "Brights" are less mature at freshwater entry than tules, with a longer time interval between freshwater entry and spawning (Marshall et al. 1995). Brights return to areas throughout the basin, but are generally later returning and are primarily destined for areas higher in the drainage. Differences between tules and brights are consistent with genetic analysis (Myers et al. 1998).

again in 2001, exceeding 600 spawners. The East Fork Lewis River has two peak spawn times with the earlier fish believed to represent the tule component of the ESU. Escapements have been stable over at least the last 10 years. Returns have averaged about 125 fish since 1990, but have exceeded the average in the last two years. Natural escapement on the Clackamas and Sandy rivers have averaged about 125 and 250, respectively in recent years. There have been no releases of hatchery fall chinook in the Clackamas River since 1981 or the Sandy River since 1977, and there are few hatchery strays in these systems. There is some natural spawning of tule fall chinook in the Wind, Little White Salmon, and Hood rivers, tributaries above Bonneville Dam. Although there may be some natural production in these systems, the spawning results primarily from hatchery-origin strays.

The LCR bright stocks are one of the few healthy natural chinook stocks in the Columbia River Basin. Escapement to the North Fork Lewis River has exceeded its escapement goal of 5,700 by a substantial margin in every year but one since 1980 with a recent five year average escapement of 8,100. The escapement in 1999 was about 3,200, substantially below goal for the first time in 20 years or more. The low return in 1999 has been attributed to severe flooding that occurred in 1995 and 1996 and was an apparent aberration. The escapement in 2000 was 8,700 natural adult spawners and 11,300 in 2001, both years well above the escapement goal.

There are two smaller populations of LCR brights in the Sandy and East Fork Lewis rivers. Average run sizes in the Sandy River have averaged about 900 over the last ten years and 800 over the last five years. Lower escapements in the last two years may be related to flood events in 1995 and 1996. The escapement in 2001 was again higher, exceeding 800 spawners. There is also a late spawning component in the East Fork Lewis River that is comparable in timing to the other bright stocks. Escapements to the East Fork Lewis River have averaged only about 150 over the last five years, but have been stable for at least the last ten years. Returns in 2000 and 2001 were at or above the long-term average.

For the LCR chinook salmon ESU, NMFS estimates that the median population growth rate (lambda) over the base period[3] ranges from 0.98 to 0.88, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000a). NMFS estimated the risk of absolute extinction for nine spawning aggregations[4], using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years ranges from zero for the Sandy River late run and Big Creek to 1.00 for Mill Creek (Table B-5 in McClure et al. 2000a). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is $\geq$0.99 for all but one of the nine spawning aggregations (zero for

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[3] Estimates of median population growth rate, risk of extinction, and likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1997 adult returns for most spawning aggregations. Population trends are projected under the assumption that all conditions will stay the same into the future.

[4] McClure et al. (2000b) have calculated population trend parameters for additional LCR chinook salmon stocks.

the Sandy River late run; Table B-6 in McClure et al. 2000a).

Upper Willamette River Chinook

The McKenzie, Clackamas, and North Santiam rivers are the primary basins that continue to support natural production. Of these the McKenzie River is considered the most important. Prior to construction of major dams on Willamette River tributaries, the McKenzie River produced 40% of the spring chinook above Willamette Falls. It may now account for 50% the production potential in the basin. Despite dam construction and other habitat degradations, the McKenzie River still supports substantial production with most of the better habitat located above Leaburg Dam. The interim escapement objective for the area above the dam is 3,000-5,000 spawners (ODFW 1998a). Pristine production in that area may have been as high as 10,000, although substantial habitat improvements would be required to achieve this pristine production level. Estimates of the number of natural-origin spring chinook returning to Leaburg Dam are available since 1994 when adults from releases of hatchery reared smolts above the dam were no longer present. The number of natural-origin fish at the dam has increased steadily from 800 in year 1994 to 3,400 in 2001 (Table 5). Escapements in 2001 were therefore within the range of the interim escapement objective. Additional spawning in areas below the dam accounts for about 20% of the McKenzie River return. Returns to the Clackamas and North Santiam rivers were also generally higher in recent years.

NMFS has estimated the risk of absolute extinction for the aggregate UWR chinook salmon population in the McKenzie River, above Leaburg Dam, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.01 (Table B-5 in McClure et al. 2000a). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 0.85 (Table B-6 in McClure et al. 2000a).

Substantial efforts have been made in recent years to remedy some of the past hatchery practices and reform harvest management. The proportion of hatchery spawners in some natural production areas has been limited and local-origin wild fish are now incorporated into the hatchery broodstock (ODFW 1998). All hatchery produced fish in the basin are now externally marked. Once these fish are fully recruited in 2002, the mass marking will greatly improve the managers' ability to monitor and control hatchery straying and production. On February 9, 2001, NMFS approved an Fishery Management and Evaluation Plan (FMEP) for ODFW's Upper Willamette chinook recreational fisheries pursuant to the ESA 4(d) Rule, Limit 4 (65 FR 42422, July 10, 2000). The FMEP implements mark-selective recreational fisheries in terminal areas. The new selective fishing regime will reduce fishery mortality to natural origin fish to no more than 15%, while increasing the overall fishing opportunity on hatchery fish. NMFS concluded that managing fisheries pursuant with the FMEP is consistent with their expected survival and recovery.

Table 5. Run size of spring chinook at the mouth of the Willamette River and counts at Willamette Falls and Leaburg Dam on the McKenzie River (ODFW and WDFW 2002). The Leaburg counts show wild and hatchery combined and wild only since 1994.

Return Year	Estimated number entering Willamette River	Willamette Falls Count	Leaburg Dam Count	
			Combined	Wild Only
1985	57,100	34,533	825	
1986	62,500	39,155	2,061	
1987	82,900	54,832	3,455	
1988	103,900	70,451	6,753	
1989	102,000	69,180	3,976	
1990	106,300	71,273	7,115	
1991	95,200	52,516	4,359	
1992	68,000	42,004	3,816	
1993	63,900	31,966	3,617	
1994	47,200	26,102	1,526	786
1995	42,600	20,592	1,622	894
1996	34,600	21,605	1,445	1,086
1997	35,000	26,885	1,176	981
1998	45,000	34,461	1,874	1,364
1999	53,900	40,410	1,909	1,383
2000	56,200	39,073	2,657	1,985
2001	72,900	53,973	4,428	3,400

Puget Sound Chinook

Puget Sound spring chinook stocks remain the most depressed component of the ESU. Of the seven spring stocks, the Dungeness, Nooksack, and White River populations have intensive hatchery recovery programs ongoing. Prior to 1996, escapements to these systems averaged less than 300, with escapements in some years of less than 100 adults. Since 1996, the North Fork Nooksack and White River populations have increased, with the White River meeting its natural escapement goal in 2000.

At the time of listing, the long- and short-term escapement trends for natural summer/fall chinook salmon runs north Puget Sound (Skagit, Stillaguamish, and Snohomish) were predominantly negative. Since that time, abundance trends have been predominantly positive for the summer/fall stocks, averaging 130% of the 1988-1996 average escapement. In south Puget Sound (Cedar, Green, Nisqually, Puyallup) and Hood Canal, both long- and short-term escapement trends were historically predominantly positive. Since listing, escapements in these areas have remained stable. However, the contribution of hatchery fish to natural escapements in these region may be substantial, masking the trends in natural production.

Across spring, summer, and fall populations, escapements in 2000 and 2001 were significantly greater in many areas, possibly due to better ocean survival condition and the effects of new harvest strategies implemented since 1997.

On April 27, 2001, NMFS applied take limits to Pacific coast ocean and Puget Sound fisheries impacting the listed PS chinook salmon ESU under the recently implemented 4(d) rule (65 FR 42422, July 10, 2000). Therefore, take prohibitions described in section 9 of the ESA for PS chinook do not apply to these fisheries, as long as they are conducted in accordance with the joint resource management plans (RMP) provided by the Puget Sound treaty tribes and Washington Department of Fish and Wildlife (WDFW) (WDFW/PNPTT 2000, WDFW/PSTT 2001) and approved under the 4(d) rule (NMFS 2001a, NMFS 2001b). Exploitation rates in Pacific coast ocean fisheries on PS chinook historically have been low, averaging 0 - 14%. In recent years, as ocean catches have been reduced to protect weak stocks, exploitation rates have averaged 0 - 4% depending on the stock (NMFS 2000b). U.S. fisheries, including the Pacific coastal ocean fisheries, will be managed to meet the PS chinook harvest management objectives described in the RMPs.

Environmental Baseline

This section updates the Environmental Baseline in the NMFS 1999 consultation by considering natural conditions, and chinook bycatch in the action area.

Recent evidence suggests that marine survival of salmon species fluctuates in response to 20-30 year long cyclic periods of either above or below average survival that is driven by climatic conditions and ocean productivity (Cramer et al. 1999). This has been referred to as the Pacific Decadal Oscillation (PDO). It is apparent that ocean conditions and resulting productivity affecting many of northwest salmon populations have been in a low phase of the cycle for some time, but that condition have improved in recent years. This is indicated by the dramatic increase in the abundance of forage fish that are prey for both salmon and whiting, e.g. herring and anchovy, beginning in 1999. Salmon ocean survival rates have correspondingly increased, going from about 1% in the mid-90s to 7-8% in 2001 (Bob Emmett, NMFS, NWFSC, pers. comm. November 15, 2001).

Drought conditions in 2001 that occurred in many of the Pacific coast watersheds were a particularly problem in the Columbia River Basin which had near record low run-off volume. The effect of this situation was magnified by the energy crisis when the Bonneville Power Administration declared a power system emergency, with the result that emergency operations of spill at the dams and target river flows did not meet the ESA requirements (FPC Memo 2001). The estimated survival rates during downstream migration for all sub-yearling chinook stocks were depressed (FPC 2001), although this may have been mitigated by effects of trapping and barging fish downstream. This event could have a negative effect fish out-migrating in 2001 which will return in the next 2-4 years. Of the four chinook ESUs considered in this review, SRF chinook have the greatest potential to be affected by the 2001 drought.

Salmon Bycatch in the Whiting Fishery

The 1999 biological opinion tabulates the bycatch of coho, pink, chum, and sockeye salmon and steelhead in the whiting fishery (NMFS 1999, see Table 14). The bycatch for all of these species is so low that the potential effect to listed species is negligible.

The bycatch of chinook salmon is more substantial. The whiting catch and associated salmonid bycatch for 1991-2001 seasons for at-sea and shoreside fisheries is summarized in Table 6. Since 1991 the annual bycatch of chinook has averaged 7,118 fish (Table 6). This compares to a catch of chinook in the ocean salmon fisheries off the Oregon and Washington coast that has averaged 181,000 fish annually during the same 1991 to 2001 time frame (PFMC 2002b). The salmon fishery catch off the Washington and Oregon coast is used for comparison because that is where most of the whiting fishery occurs. The 11,000 chinook limit has been exceeded just twice since 1991, once in 1995 with 14,533 fish and again in 2000 with 11,527 fish. The estimated whiting catch in 2000 of 206,471 mt was 89% of the total allowable catch (TAC), so the bycatch could have been significantly higher (Helser et al. 2002). The tribal fishery, in particular, fell well short of its allocation. In this section, we consider the factors which may have contributed to higher bycatch, in general, and 2000 in particular.

Table 6. Summary of Chinook Salmon Bycatch in the Pacific Whiting Fishery by Sector - Years 1991-2001 [whiting in metric tons (mt), chinook in numbers of fish]. Numbers in bold represent those years that were above annual bycatch rate of 0.05 chinook/mt whiting and a total bycatch of 11,000 chinook specified in the the Incidental Take Statement of the December 15, 1999 biological opinion.

	1991*	1992*	1993*	1994*	1995*	1996*	1997*	1998	1999	2000	2001
MOTHERSHIP											
CHINOOK (number of fish)	2580	2869	1223	2568	8487	795	845	966	1687	4421	1721
WHITING (mt)	79803	36172	14515	91926	40588	44416	50402	50087	47580	46840	35823
RATE: (# chinook/mt whiting)	0.0323	**0.0793**	**0.0843**	0.0279	**0.2091**	0.0179	0.0168	0.0193	0.0355	**0.0944**	0.0480
CATCHER/PROCESSOR											
CHINOOK (number of fish)	3585	1994	3620	1058	3092	650	553	511	2704	1839	847
WHITING (mt)	117102	116277	84588	87147	61571	68359	70771	70365	67679	67815	58628
RATE: (# chinook/mt whiting)	0.0306	0.0171	0.0428	0.0121	**0.0502**	0.0095	0.0078	0.0073	0.0400	0.0271	0.0144
TOTAL NONTRIBAL ATSEA											
CHINOOK (number of fish)	6165	4862	4843	3626	11579	1445	1398	1477	4391	6260	2568
WHITING (mt)	196905	152448	99103	179073	102159	112775	121173	120452	115259	114655	94451
RATE: (# chinook/mt whiting)	0.0313	0.0319	0.0489	0.0202	**0.1133**	0.0128	0.0115	0.0123	0.0381	**0.0546**	0.0272
TRIBAL (MOTHERSHIP)											
CHINOOK (number of fish)	na	na	na	na	na	1707	2524	2085	4497	1947	959
WHITING (mt)	na	na	na	na	na	14999	24839	24509	25844	6251	6080
RATE: (# chinook/mt whiting)	na	na	na	na	na	**0.1138**	**0.1016**	**0.0851**	**0.1740**	**0.3115**	**0.1577**
TOTAL OF ALL ATSEA											
CHINOOK (number of fish)	6165	4862	4843	3626	11579	3152	3922	3562	8888	8207	3527
WHITING (mt)	196905	152448	99103	179073	102159	127774	146012	144961	141103	120906	100531
RATE: (# chinook/mt whiting)	0.0313	0.0319	0.0489	0.0202	**0.1133**	0.0247	0.0269	0.0246	**0.0630**	**0.0679**	0.0351
SHORE-BASED											
CHINOOK (number of fish)	41	491	419	581	2954	651	1482	1699	1696	3320	2634
WHITING (mt)	20359	49092	41926	72367	73397	84680	87499	87627	83350	85565	73326
RATE: (# chinook/mt whiting)	0.0020	0.0100	0.0100	0.0080	0.0402	0.0077	0.0169	0.0194	0.0203	0.0388	0.0359
TOTAL ALL FISHERIES											
CHINOOK (number of fish)	6206	5353	5262	4207	**14533**	3803	5404	5261	10584	**11527**	6161
WHITING (mt)	217264	201540	141029	251440	175556	212454	233511	232588	224453	206471	173857
RATE: (# chinook/mt whiting)	0.0286	0.0266	0.0373	0.0167	**0.0828**	0.0179	0.0231	0.0226	0.0472	**0.0558**	0.0354

* NOTE: 1991-1997 is based final inseason data files and may vary from estimates derived from NORPAC data. Shoreside data updated from Parker 2001.

NMFS previously reviewed the circumstances related to the high bycatch event in 1995 (Dorn 1995). The report contains three general observations. First, much of the bycatch occurs in relatively few tows. In 1995, 25 tows out of a total of over 2,200 accounted for 37% of the estimated bycatch in the at-sea fishery. Second, the higher bycatch tows tended to occur in relatively shallow water. Finally, the Hecata Banks area off the southern Oregon coast (Figure 1) was a hot spot accounting for 11 of the 25 higher bycatch tows. Higher bycatches were also observed in this same area from 1992-1994, the only other years reviewed in the 1995 report.

The circumstances were similar in the 2000 fishery. For the at-sea fishery the top 25 tows out of nearly 2,500 accounted for 32% of the estimated bycatch in the at-sea fishery. Industry representatives continue to report that fishing shallow, generally inside 100 fathoms (183 m), increases the risk of high bycatch tows. However, the distribution of the high bycatch tows was different. In 2000, all but one of the high bycatch tows in the at-sea fishery were located off the north-central Washington coast.

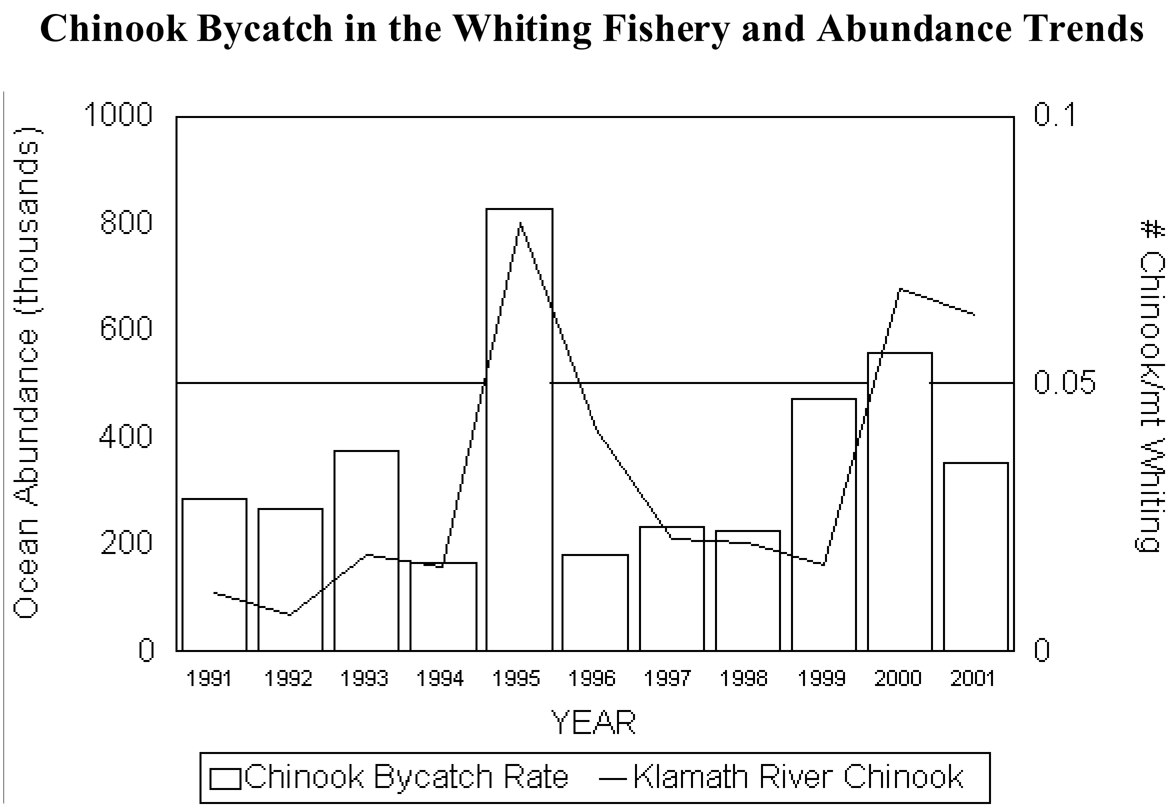
A common suggestion used to explain the higher bycatch is that the bycatch rate is related to the abundance of salmon. Figure 2 shows the relationship between the overall bycatch rate of chinook and the abundance of Klamath River origin chinook salmon. This indicates that the years of peak bycatch were coincident with the higher abundance of Klamath River chinook. The Klamath River is located in northern California (Figure 1). Klamath River chinook generally range from central Oregon to central California, so their influence on ocean abundance would be limited to the areas south of the Columbia River.

Other abundance indicators were also considered including an index of chinook abundance in the area north of Cape Falcon, Oregon; the run size of lower Columbia River hatchery stocks (which are the primary contributor to fisheries off the Washington coast); catch per unit effort estimates for both commercial and recreational fisheries off Oregon; west coast ocean salmon fishery chinook catch; and the Central Valley Index (CVI) for chinook. None of these were closely related to the bycatch rate of chinook in the whiting fishery.

It is apparent that the bycatch rates in the tribal fishery are generally higher than those of the other fishing sectors (Table 6). The higher bycatch is likely due, at least in part, to the relatively confined geographic area which limits the tribe's fishery. Their treaty defined fishing area extends out to about 40 miles off the northern Washington coast, is confined to the north by the U.S. border, and to the south by 48°02'15" N. lat. The area is relatively small and virtually all within the 100 fathoms (183 m) contour (Figure 1). This limits the tribes ability to search for areas of low chinook abundance and confines them to shallow water where chinook abundance is relatively high.

Finding consistent patterns related to the bycatch is complicated by the dynamic nature of the ocean which affects the distribution and abundance of whiting, salmon, and other species. Recent studies conducted off the west coast indicate that ocean productivity has increased since 1999. Forage fish that are prey for both salmon and whiting, e.g. herring and anchovy, have since increased dramatically. Salmon ocean survival rates have correspondingly increased, as indicated by recent dramatic increases in adult returns to areas like the Columbia River Basin. The colder waters off the west coast have also truncated the migration of whiting north along the

Figure 2. Comparison of the chinook bycatch rate in the Pacific whiting fishery with Klamath River chinook salmon ocean abundances for the 1991-2001 time period. The ESA consultation bycatch rate designated in the Incidental Take Statement is 0.050 chinook/mt of whiting (NMFS 1999).



west coast in recent years. This is evidenced by the shortfall of catch in the Canadian whiting fishery. In the past, the Canadian fishery off the west coast of Vancouver Island has routinely taken its full allocation of whiting. In 2000 and 2001 they were only able take 25% and 65%, respectively, of their target catch. The tribal fishery was also limited by the availability of whiting in the last two years. The greater availability of forage fish also appears to have scattered the whiting into smaller schools. The dispersed distribution of the whiting seemed particularly problematic 2000. The industry representatives reported greater difficulty in finding schools, and that the school densities were generally low. This resulted in more prospecting and a greater temptation to fish closer inshore, behavior which likely contributed to the higher bycatch in 2000.

It is difficult to discern patterns in the bycatch data or adequately explain why bycatch was higher than normal in particular years. There is some indication that the abundance of salmon, particularly off the Oregon coast, may be a contributing factor. But generally speaking, the abundance of salmon does not seem to be the key factor related to salmon bycatch.

Bycatch rates in the tribal fishery have been consistently higher than those of the other sectors in other areas. The tribal fishery will likely continue to contribute disproportionally to the overall bycatch.

The biggest unknown is how ocean dynamics affect the distribution of whiting. Apart from apparent broad scale shift in ocean productivity, conditions have been further complicated by recent El Niño (1997/98) and La Niña (1998-2000) events. Ocean conditions in 2000 were notably different and they likely contributed to the higher than usual bycatch rates. However, the relative low bycatch in 2001 suggests that more productive ocean conditions will not routinely result in higher bycatch rates. There is no evidence at this time to suggest that the whiting fishery can not operate within the 11,000 chinook bycatch limit in most years.

The potential for higher bycatch will also be reduced for the next few years at least since the allowable catch of whiting has been substantially reduced (Helser et al. 2002). The NMFS proposed U.S. whiting allocation is 129,600 mt for 2002, compared to a recent 5-year average of 223,680 mt. Because of the recent decline in the biomass of whiting, the allowable catch is expected to be relatively low for the next several years.

Measures Taken to Reduce Bycatch

As a result of the previous consultations, the whiting fishery is already subject to several conservation related constraints designed to minimize the bycatch of chinook salmon in particular (NMFS 1999)(Federal Pacific Coast Groundfish Regulations, 50 CFR § 660.323 (a)(3)). The targeted harvest of whiting inside of 100 fathoms (183 m) in the Eureka catch area is restricted (Figure 1). The start of the at-sea whiting fishery north of 42°00' N. lat. is delayed annually until at least May 15. In addition, Federal regulations (50 CFR § 660.323 (a)(3)) prohibit at-sea processing and night fishing (midnight to one hour after official sunrise) south of 42°00' N. lat., and also prohibit all fishing inside the nearshore Klamath and Columbia River Salmon Conservation Zones. Shore-based fishing is allowed after April 1 between 40°30' and 42°00' N. lat., but is limited to 5% of the shore-based allocation being taken prior to the opening of the main shore-based fishery on June 15. Finally, the recent biological opinion limits the bycatch rate of 0.05 chinook/mt whiting and a total bycatch of 11,000 chinook annually.

The whiting fishery is monitored through various Federal, state, Tribal, and industry programs. The primary programs include the Shoreside Whiting Observation Program (SWOP), and the North Pacific Groundfish Observer Program (NPGOP) for the at-sea fishery sectors.

As part of the Federal regulations there is a voluntary bycatch reduction and full utilization program for at-sea processors (Federal Pacific Coast Groundfish Regulations, 50 CFR § 660.323 (a)(3)). If catcher/processors or motherships chose to participate in the program, they are required to carry more than one NMFS-approved observer for at least 90 percent of the fishing days during a cumulative trip limit period. Observers then monitor bycatch of other species such as salmon. In recent years, all the whiting vessels have parcipated in the program.

In 1997, participants in the catcher/processor sector of the Pacific whiting fishery formed the Pacific Whiting Conservation Cooperative (PWCC) to reduce the bycatch and increase yields from the harvest of Pacific whiting. The PWCC members also voluntarily set up an information sharing system to help avoid bycatch "hotspots." The program is managed by Sea State, a private sector firm specializing in fisheries data collection and analysis. PWCC members report catch and bycatch data electronically to Sea State. Sea State collates the data and reports back to PWCC vessels on a "real time" basis, advising vessel captains to avoid areas in which high bycatch is likely to occur. To ensure compliance with federal fishery regulations and terms of the cooperative, each PWCC member vessel carries two federal fishery observers to monitor catch and bycatch. PWCC members bear the cost of observer coverage. In addition, PWCC members are assessed a tonnage fee that is used to fund scientific research, including stock assessment and bycatch avoidance programs.

During the review of 2000 whiting fishing season, NMFS queried the whiting industry and co-managers on additional management measures that could help the fleet to continue to operate within the prescribed take limits (Robinson 2000). Industry representatives from each sector provided summaries of actions already taken, and additional actions that either would or could be taken to further safeguard against high salmon bycatch (Jacobs 2001, Makah Fisheries Management 2001, Meyer 2001, Parker and Hutton 2001).

NPGOP is proposing for 2002 a pilot project to video tape the sampling procedures as a validation tool for observer sampling. Currently, they plan on using this new equipment for a month on one vessel in the whiting fleet. The SWOP is currently investigating salmon bycatch in correlation with coded wire tags (CWT) recovery information to describe, model, and potentially predict salmon bycatch prior to the start of each season. In addition, for the 2002 season SWOP plans on conducting video documentation studies in conjunction with the observer program, and also hopes to re-validate the shoreside observer program with at-sea or onboard observers. The Excellence mothership, used in the Makah Tribe whiting fishery, was able to increase partial haul sampling in 2001, but was not able to sample all tows, and still had to rely on basket sampling in some cases. This effort was designed to increase sample size and the precision of the bycatch estimates. Sea State and PWCC improved data collection and analysis for the at-sea fleet to provide better information regarding salmon hotspots.

Conclusion

During the 2000 season, the bycatch of chinook salmon and bycatch rate in the whiting fishery were 11,527 chinook and 0.058 chinook/mt of whiting, thus exceeding the bycatch limits set in the December 15, 1999 biological opinion.

NMFS reviewed the status of the SRF, LCR, UWR, and PS chinook ESUs and the environmental baseline. Generally, the status of the populations, indicated by increasing abundance, has improved over the last two years coincident improving ocean conditions. The previous consultation indicated that the exploitation rates of the affected ESUs were on the order of some fraction of 1% per year. Based on this review, NMFS concludes that there is no new information suggesting the need to revise the chinook bycatch limits specified in the 1999 biological opinion or the no jeopardy conclusion.

NMFS next focused on the possible causes of the higher bycatches in the 2000 season and the fishery in general. We continue to see that high bycatch tows are a relatively rare event. In 1995 and 2000, 1% of the tows accounted for an average of about 35% of the estimated bycatch in the at-sea fishery. Apart from the Klamath data, high bycatch does not appear to be closely related to chinook abundance. There still is a general consensus that fishing shallow increases the risk of chinook bycatch. Because the Tribal fishery is relatively confined, it will likely continue to contribute disproportionally to the overall bycatch. Ocean condition clearly affect the migration patterns and distribution of whiting and chinook in ways that are not well understood. Ocean conditions in 2000 were clearly aberrant causing a much truncated migration of whiting and more dispersed schools. The higher bycatch rate in 2000 was likely related, at least in part, to the unusual distribution patterns. The lower bycatch rates observed in 2001 suggest that the high bycatch in 2000 was a transient event, and not indicative of a substantive change that will lead to consistently higher bycatches.

Finally, NMFS reviewed the management measure currently in place to limit bycatch, and those that have been implemented voluntarily by the industry. Given, the circumstances NMFS concludes that there is no need to require additional management actions, but continues to encourage the industry to take all actions necessary to manage within the prescribed limits. Additional management actions will be considered in the future if the bycatch increases and establishes a new pattern of routinely exceeding the overall bycatch limits of 0.05 chinook/mt whiting and a total bycatch of 11,000 chinook per year.

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cc: Richard Methot, Elizabeth Clarke (NWFSC); Paula Evans (SF3); Lamont Jackson (PR3); Michael Bancroft (NWGC); Reading File

Appendix 1.

Chronology of Events related to the Reinitiated Section 7 Consultation on the Whiting Fishery Conducted under the Pacific Coast Groundfish Fishery Management Plan

Date: April 22, 2002

It was apparent through the latter part of the 2000 season that the bycatch rates of chinook salmon were higher than usual in the whiting fishery, and that the bycatch limit might be exceeded. On September 20, 2000 the National Marine Fisheries Service (NMFS), Northwest Region, Sustainable Fisheries Division (SFD), estimated that the bycatch of chinook had exceeded the incidental take statement (ITS) limit of 11,000 chinook set in the 1999 consultation.

On September 28, 2000 the Makah Tribal Council contacted the NMFS regarding the 2000 treaty allocation of 32,500 mt of whiting (Sones 2000). The Makah Tribe indicated that they would not be able to harvest all of their allocation, and that they would like to voluntarily release 10,000 mt of whiting to the non-treaty fishers. NMFS responded on October 24, 2000 and indicated that they would not approve a reallocation because the salmon bycatch limit had already been exceeded (Robinson 2000a). The letter also announced that NMFS would reinitiate its 1999 consultation, and that NMFS was planning an evening session at the November Pacific Fishery Management Council (PFMC) meeting to discuss the situation with industry.

NMFS met with industry representatives on October 31, 2000, concurrent with the PFMC meeting in Vancouver, WA, to discuss the events that lead to exceeding the chinook catch limit. At this meeting, NMFS reiterated that consultation would be reinitiated, and asked for information relevant to the bycatch situation in the 2000 fishery. In addition, NMFS asked the industry for their suggestions on additional management measures that could be implemented which would help the fleets to continue to operate within the prescribed bycatch limits. The whiting industry indicated that there was a discernable change in the behavior of the whiting stock in 2000, with a greater occurrence of smaller, scattered schools of fish. They also asked NMFS to address their concerns over the estimates of bycatch that were generated from whiting observer program, and to provide more information on the stock composition of the salmon bycatch. At the end of the meeting NMFS said they would send a letter reiterating their request for information on future management measures, and also set another meeting date in early January to continue the discussion.

NMFS met with the NMFS' Northwest Fisheries Science Center (NWFSC) staff to discuss possible improvements in the whiting observer program on December 1, 2000. NMFS continued their interaction with the NWFSC through the spring of 2001 as they continued to explore related problems and remedies.

NMFS sent a letter of response to the industry representatives on December 5, 2000 (Robinson 2000b), as promised at the October 31, 2000 meeting. NMFS' letter presented a summary of the October 31, 2000 meeting; an assessment of the industry's suggestions from October meeting; an announcement of an additional meeting for January 5, 2001 at the NMFS Sand Point Office, Seattle; and also requested that the industry provide written reports outlining management actions taken to date and additional actions that could be taken to reduce the level of chinook bycatch.

On January 4, 2001 NMFS and NWFSC toured the observer sampling stations and processing facilities of two motherships in the whiting fleet, the Ocean Phoenix and the Excellence (used in Makah Tribal fishery).

The NMFS, NWFSC, and Whiting industry met on January 5, 2001 at Sand Point. The discussion focused on ways of reducing the chinook bycatch in the whiting fishery, and improving the whiting observer program to provide better estimates of salmon bycatch.

NMFS received letters in February, 2001 from each of the four harvest sectors outlining actions taken to date and further actions they expect to take to continue to minimize the bycatch of chinook (Jacobs 2001, Makah Fisheries Management 2001, Meyer 2001, Parker and Hutton 2001).

The 2001 whiting proceeded without the high bycatch problems of the previous year. The estimated bycatch of chinook was about 6,200 fish and 0.035 chinook/mt of whiting.

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